Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Final recommendation statement: adolescent idiopathic scoliosis: screening.

Bibliographic Source(s)

Final recommendation statement: adolescent idiopathic scoliosis: screening. [internet]. Rockville (MD): U.S. Preventive Services Task Force (USPSTF); 2018 Jan [8 p]. [28 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous: U.S. Preventive Services Task Force (USPSTF). Screening for idiopathic scoliosis in adolescents: recommendation statement. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2004 Jun. 4 p. [4 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition

YES	Multidisciplinary Group
YES	Methodologist Involvement
▮▮▮▯▯	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
▮▮▮▮▮	Search Strategy
▮▮▮▮▮	Study Selection
▮▮▮▮▮	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
▮▮▮▮▯	Grading the Quality or Strength of Evidence
▮▮▮▮▮	Benefits and Harms of Recommendations
▮▮▮▮▮	Evidence Summary Supporting Recommendations
▮▮▮▮▮	Rating the Strength of Recommendations
▮▮▮▮▮	Specific and Unambiguous Articulation of Recommendations
▮▮▮▯▯	External Review
▮▮▮▮▮	Updating

Recommendations

Major Recommendations

The U.S. Preventive Services Task Force (USPSTF) grades its recommendations (A, B, C, D, or I) and identifies the levels of certainty regarding net benefit (High, Moderate, and Low). The definitions of these grades can be found at the end of the "Major Recommendations" field.

Recommendation Summary

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for adolescent idiopathic scoliosis in children and adolescents aged 10 to 18 years. (I statement)

Clinical Considerations

Patient Population Under Consideration

This recommendation applies to asymptomatic children and adolescents aged 10 to 18 years. This recommendation does not apply to children and adolescents presenting for evaluation of back pain, breathing difficulties, abnormal radiography findings or other imaging studies, or obvious deformities in spinal curvature.

Screening Tests

Most screening tests for adolescent idiopathic scoliosis are noninvasive. Screening is usually done by visual inspection of the spine to look for asymmetry of the shoulders, shoulder blades, and hips. In the United States, the forward bend test is commonly used to screen for idiopathic scoliosis. First, a clinician visually inspects the spine of a patient while the patient is standing upright. Next, the patient stands with feet together and bends forward at the waist with arms hanging and palms touching. The clinician repeats the visual inspection of the spine. A scoliometer, which measures the angle of trunk rotation, may be used during the forward bend test. An angle of trunk rotation of 5° to 7° is often the threshold for referral for radiography. Other screening tests include a humpometer, the plumb line test, and Moiré topography (creating a 3-dimensional image of the surface of a patient's back) (see the table in the original guideline document).

If idiopathic scoliosis is suspected, radiography is used to confirm the diagnosis and to quantify the degree of curvature (i.e., the Cobb angle) and the Risser sign (the stage of ossification of the iliac apophysis). U.S. organizations that advocate screening recommend the forward bend test combined with scoliometer measurement.

Treatment

The goal of treatment is to decrease or stop progression of spinal curvature during the period of adolescent growth prior to skeletal maturity. Treatment of adolescent idiopathic scoliosis is determined by the degree of spinal curvature and the potential for further growth and generally includes observation, bracing, surgery, and exercise.

Suggestions for Practice Regarding the I Statement

Potential Preventable Burden

Most children and adolescents with scoliosis do not have symptoms. Generally, smaller spinal curvatures remain stable, while larger curvatures tend to progress in severity.

Pulmonary dysfunction can be clinically significant in patients with spinal curvatures greater than 100°; however, curvatures of that severity are rare. Back pain is more common, but its effect on functioning or disability is unclear. Current evidence suggests that the presence of back pain does not necessarily correlate with the degree of spinal curvature in adulthood. Adults with adolescent idiopathic scoliosis may have poor self-reported health, appearance, and social interactions. Mortality is similar to that among unaffected adults.

Potential Harms

Evidence on the harms of screening for adolescent idiopathic scoliosis is limited. False-positive results are an important potential harm, with rates ranging from 0.8% to 21.5%. However, the direct harms of screening are unclear. Potential harms of false-positive results include unnecessary follow-up visits, increased cancer risk attributable to radiation exposure, overtreatment, or psychosocial effects associated with the diagnosis of clinically nonsignificant scoliosis.

Current Practice

Various organizations have recommended routine screening for scoliosis in children and adolescents since the 1980s. More than half of U.S. states either mandate or recommend school-based screening for scoliosis. Children and adolescents are usually screened with the forward bend test, with or without scoliometer measurement.

In general, patients with a Cobb angle of less than 20° are observed without treatment; however, exercise may be recommended at this time. Patients with a Cobb angle greater than 30° or a Cobb angle of 20° to 30° that progresses 5° or more over 3 to 6 months are treated with bracing. Patients with a Cobb angle of 40° to 50° may be treated with bracing or surgery, while those with a Cobb angle greater than 50° typically require surgery.

Definitions

What the U.S. Preventive Services Task Force (USPSTF) Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer or provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer or provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer or provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality or conflicting, and the balance of benefits and harms cannot be determined.	Read the "Clinical Considerations" section of the USPSTF Recommendation Statement (see the "Major Recommendations" field). If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF Levels of Certainty Regarding Net Benefit

Definition: The U.S. Preventive Services Task Force defines *certainty* as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general, primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

Level of Certainty	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by factors such as: The number, size, or quality of individual studies Inconsistency of findings across individual studies Limited generalizability of findings to routine primary care practice Lack of coherence in the chain of evidence As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: The limited number or size of studies Important flaws in study design or methods Inconsistency of findings across individual studies Gaps in the chain of evidence Findings not generalizable to routine primary care practice A lack of information on important health outcomes More information may allow an estimation of effects on health outcomes.

Level of Certainty	Description

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Idiopathic scoliosis

Guideline Category

Prevention

Screening

Clinical Specialty

Family Practice

Internal Medicine

Pediatrics

Preventive Medicine

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

To update the 2004 USPSTF recommendation on screening for idiopathic scoliosis in adolescents

Target Population

Asymptomatic children and adolescents aged 10 to 18 years

Note: This recommendation does not apply to children and adolescents presenting for evaluation of back pain, breathing difficulties, abnormal radiography findings or other imaging studies, or obvious deformities in spinal curvature.

Interventions and Practices Considered

Screening for idiopathic adolescent scoliosis using visual inspection of the spine and forward-bending test, with or without a scoliometer

Major Outcomes Considered

- Key Question 1: Does screening for adolescent idiopathic scoliosis (AIS) improve: a) health outcomes, and b) the degree of abnormal spinal curvature in childhood or adulthood?
- Key Question 2: What is the accuracy of screening for AIS?
- Key Question 3: Does treatment of AIS that has a Cobb angle of less than 50° at diagnosis improve: a) health outcomes, and b) the degree of spinal curvature in childhood or adulthood?
- Key Question 4: What is the association between severity of spinal curvature in adolescence and health outcomes in adulthood?
- Key Question 5: What are the harms of screening for AIS?
- Key Question 6: What are the harms of treatment of AIS that has a Cobb angle of less than 50° at diagnosis?

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Searches of Unpublished Data

Description of Methods Used to Collect/Select the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic evidence review was prepared by the Kaiser Permanente Research Affiliates Evidence-based Practice Center (EPC) for the U.S. Preventive Services Task Force (USPSTF) (see the "Availability of Companion Documents" field).

Data Sources and Searches

EPC staff conducted an initial literature search for existing systematic reviews and guidelines on the topic of idiopathic scoliosis in adolescent and pediatric populations. The search was limited to English-language articles published between 2004 and May 2015. The Canadian Agency for Drugs and Technologies in Health, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects (Centre for Reviews and Dissemination), DynaMed, First Consult, Health Technology Assessment (Centre for Reviews and Dissemination), National Institute for Health and Clinical Excellence, Ovid MEDLINE, and PubMed (publisher-supplied) were searched. These studies helped clarify the key questions (KQs).

EPC staff worked with a research librarian to develop the search strategy for the evidence review. The search strategy was peer reviewed by a second research librarian. Databases searched included Cochrane Central Register of Controlled Trials, Ovid MEDLINE, ERIC (Eric.ed.gov), PubMed (publisher supplied), and the Cumulative Index to Nursing and Allied Health Literature. Results of the literature search were imported into EndNote and duplicates were removed. Databases were searched for articles published from January 1966 to October 31, 2015. The search strategies for existing systematic reviews and the comprehensive evidence review are included in Appendix A in the evidence synthesis (see the "Availability of Companion Documents" field). Database searches were supplemented by reviewing reference lists from

recent and relevant systematic reviews. Investigators also searched ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform for relevant ongoing trials (see Appendix B in the evidence synthesis). The search was updated on October 20, 2016.

Study Selection

Two reviewers independently reviewed 8,230 titles and abstracts using an online platform (Abstrackr) and 1,088 articles (Appendix A Figure 1 in the evidence synthesis) against specified inclusion criteria (Appendix A Table 1 in the evidence synthesis). Discrepancies were resolved through consensus and consultation with a third investigator. Articles that did not meet inclusion criteria or those rated as poor quality were excluded. Appendix C of the evidence synthesis lists all excluded trials.

For screening questions (KQs 1, 2, and 5), the screening population of interest was asymptomatic children ages 10 to 18 years. Screening studies in primary care–referable settings or school-based screening programs using FBT with or without a scoliometer, as well as surface topography (Moiré) were included. No screening tests were excluded. For KQs 1 through 4, randomized trials, controlled trials, and cohort studies were included; for KQs 5 and 6 (harms) case series and case-control studies were also included. Studies of poor quality, case reports, qualitative studies, and cost-effectiveness studies were excluded. Screening accuracy studies had to include x-ray confirmation; screening studies in which screening was done by a single person or the screening practitioner was not well described were excluded. Studies in which the referral criteria were not quantitatively described were excluded (e.g., referral to x-ray "at 5° or higher trunk rotation on scoliometer" would be included, while referral to x-ray based "on any asymmetry in appearance" would be excluded). Studies in which the flow of participants was incompletely described and studies in which less than 60 percent of those who screened positive received x-ray were also excluded. For screening effectiveness (KQ 1), studies that reported curve severity or any health outcomes, quality of life, pain or functional outcomes, and mortality were included. For screening accuracy (KQ 2), scoliosis was defined as a Cobb angle of 10° or greater. For harms of screening (KQ 5), studies that reported any direct harm of screening procedures persisting 6 months after screening were included.

For treatment questions (KQs 3 and 6), studies of children and adolescents ages 10 to 18 years diagnosed with AIS with a Cobb angle of 10° to 50° at detection were included. Studies with populations with infantile- or juvenile-onset scoliosis and scoliosis of other known etiology were excluded. Since children with a curve greater than 45° to 50° are likely to present clinically and therefore are not likely to be candidates for screening, included studies were required to contain some data on a screening population of children with a curve between 10° and 50°, which was operationalized as curve data reported before the curve has reached 50°. Studies with a comparison of observation or usual care were included, and comparative effectiveness studies and studies in which the comparison group was determined post hoc or represented stratified results, such as compliant and noncompliant with brace wear, were excluded. Studies of surgical and nonsurgical treatments were eligible, but studies that exclusively evaluated out of date treatments (Harrington rod instrumentation, Milwaukee brace, and electrical surface stimulation) and studies in which treatment was conducted by a single practitioner (e.g., a single surgeon, therapist, or bracer) were excluded. For treatment effectiveness (KQ 3), studies that reported adult health outcomes pertaining to morbidity, quality of life, functional outcomes, or mortality were included. Treatment harms (KQ 6) persisting 6 months or more after treatment initiation were included. Pain and functional outcomes were considered as health outcomes for KQ 3 (e.g., quality of life, pain, morbidity).

For the natural history question (KQ 4), randomized, controlled trials (RCTs), controlled trials, cohort studies, and large registry-based observational studies of screen-detected children and adolescents ages 10 to 18 years diagnosed with AIS that has a Cobb angle of 10° or greater were included. Studies of any treatment type (including Harrington rod or Milwaukee brace) were included. Healthy controls were excluded from analysis.

For applicability to U.S. practice, the EPC staff focused on studies conducted in countries deemed "very high" development according to the United Nations' Human Development Index. Only included studies published in English were included. Studies rated as poor quality, case reports, cross-sectional studies,

and cost-effectiveness studies were excluded.

Number of Source Documents

The Evidence-based Practice Center (EPC) reviewed 8,230 unique abstracts and 1,088 full-text articles (Appendix A Figure 1 in the evidence synthesis). They included 26 unique articles. They included seven studies (13 articles) on screening accuracy (Key Question [KQ] 2), seven studies (nine articles) on the effectiveness of treatment (KQ 3), one study (two articles) on the harms of treatment (KQ 6), and two studies (five articles) on long-term outcomes (KQ 4). No studies met the inclusion criteria on the effect of adolescent idiopathic scoliosis (AIS) screening on long-term health outcomes (KQ 1) or on the harms of screening (KQ 5).

See the literature search flow diagram (Appendix A Figure 1) in the evidence synthesis (see the "Availability of Companion Documents" field) for a summary of evidence search and selection.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

At least two reviewers critically appraised all articles that met the inclusion criteria based on the USPSTF's design-specific quality criteria (see Appendix A in the evidence review [see the "Availability of Companion Documents" field]). These criteria were supplemented with the Newcastle Ottawa scales for cohort and case-control studies. Articles were rated as good, fair, or poor quality. In general, a good-quality study met all criteria. A fair-quality study did not meet, or it was unclear if it met, at least one criterion but had no known important limitations that could invalidate its results. A poor-quality study had a single fatal flaw or multiple important limitations. The most common fatal flaws for screening studies included unclear referral criteria for the screening examination or unclear diagnostic threshold. The reviewers excluded poor-quality studies. Disagreements about critical appraisal were resolved by consensus and, if needed, in consultation with a third independent reviewer.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Note from the National Guideline Clearinghouse (NGC): A systematic evidence review was prepared by the Kaiser Permanente Research Affiliates Evidence-based Practice Center for the U.S. Preventive Services Task Force (USPSTF) (see the "Availability of Companion Documents" field).

Quality Assessment and Data Extraction

At least two reviewers critically appraised all articles that met the inclusion criteria based on the USPSTF's design-specific quality criteria (see the "Rating Scheme for the Strength of the Evidence" field).

One reviewer extracted key elements of included studies into standardized evidence tables in Microsoft Excel® (Microsoft Corp., Redmond, WA). A second reviewer checked the data for accuracy. Evidence tables were tailored to each key question (KQ) and to specific study designs. Tables generally included details on study design and quality, setting and population (e.g., country, inclusion criteria, age, sex,

race/ethnicity, maturity of population), screening and treatment details, reference standard or comparator details (if applicable), length of followup, and outcomes (e.g., accuracy, effectiveness, harms).

Data Synthesis and Analysis

Because of the limited number of studies and the heterogeneity of outcomes assessed, interventions used, and presentation of results (such as category of scoliosis curve), reviewers provided a narrative synthesis of results and used summary tables to compare results across different studies. For KQ 2 (accuracy), values were calculated from data provided where possible.

The reviewers used a standardized summary of the evidence table to summarize the overall strength of evidence for each KQ. This table included the number and design of included studies, summary of findings by outcome, consistency or precision of results, reporting bias, summary of study quality, limitations of the body of evidence, and applicability of the findings.

Grading the Strength of the Body of Evidence

The reviewers graded the strength of the overall body of evidence for each KQ using an adapted Evidence-based Practice Center approach, which is based on a system developed by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group. The method explicitly addresses four of the five required domains: consistency (similarity of effect direction and size), precision (degree of certainty around an estimate), reporting bias (potential for bias related to publication, selective outcome reporting, or selective analysis reporting), and study quality (i.e., study limitations). The reviewers did not address the fifth required domain—directness—as it is implied in the structure of the KQs (i.e., pertains to whether the evidence links the interventions directly to a health outcome).

Consistency was rated as reasonably consistent, inconsistent, or not applicable (e.g., single study). Precision was rated as reasonably precise, imprecise, or not applicable (e.g., no evidence). Reporting bias was rated as suspected, undetected, or not applicable (e.g., when there is insufficient evidence for a particular outcome). Study quality reflects the quality ratings of the individual trials and indicates the degree to which the included studies for a given outcome have a high likelihood of adequate protection against bias. The body of evidence limitations field highlights important restrictions in answering the overall KQ (e.g., lack of replication of interventions, non-reporting of outcomes important to patients).

The reviewers graded the overall strength of evidence as high, moderate, or low. "High" indicates high confidence that the evidence reflects the true effect and that further research is very unlikely to change the confidence in the estimate of effects. "Moderate" suggests moderate confidence that the evidence reflects the true effect and that further research may change confidence in the estimate of effect and may change the estimate. "Low" indicates low confidence that the evidence reflects the true effect and that further research is likely to change confidence in the estimate of effect and is likely to change the estimate. A grade of "insufficient" indicates that evidence is either unavailable or does not permit estimate of an effect. Two independent reviewers rated each KQ according to consistency, precision, reporting bias, and overall strength of evidence grade. Discrepancies were resolved through consensus discussion involving more reviewers.

Methods Used to Formulate the Recommendations

Balance Sheets

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The U.S. Preventive Services Task Force (USPSTF) systematically reviews the evidence concerning both the benefits and harms of widespread implementation of a preventive service. It then assesses the

certainty of the evidence and the magnitude of the benefits and harms. On the basis of this assessment, the USPSTF assigns a letter grade to each preventive service signifying its recommendation about provision of the service (see table below). An important, but often challenging, step is determining the balance between benefits and harms to estimate "net benefit" (that is, benefits minus harms).

U.S. Preventive Services Task Force Recommendation Grid*

Certainty of Net Benefit	Magnitude of Net Benefit			
	Substantial	Moderate	Small	Zero/Negative
High	A	B	C	D
Moderate	B	B	C	D
Low	Insufficient			

**A*, *B*, *C*, *D*, and *I (Insufficient)* represent the letter grades of recommendation or statement of insufficient evidence assigned by the USPSTF after assessing certainty and magnitude of net benefit of the service (see the "Rating Scheme for the Strength of the Recommendations" field).

The overarching question that the USPSTF seeks to answer for every preventive service is whether evidence suggests that provision of the service would improve health outcomes if implemented in a general primary care population. For screening topics, this standard could be met by a large randomized controlled trial (RCT) in a representative asymptomatic population with follow-up of all members of both the group "invited for screening" and the group "not invited for screening."

Direct RCT evidence about screening is often unavailable, so the USPSTF considers indirect evidence. To guide its selection of indirect evidence, the USPSTF constructs a "chain of evidence" within an analytic framework. For each key question, the body of pertinent literature is critically appraised, focusing on the following 6 questions:

> Do the studies have the appropriate research design to answer the key question(s)?
> To what extent are the existing studies of high quality? (i.e., what is the internal validity?)
> To what extent are the results of the studies generalizable to the general U.S. primary care population and situation? (i.e., what is the external validity?)
> How many studies have been conducted that address the key question(s)? How large are the studies? (i.e., what is the precision of the evidence?)
> How consistent are the results of the studies?
> Are there additional factors that assist the USPSTF in drawing conclusions (e.g., presence or absence of dose–response effects, fit within a biologic model)?

The next step in the USPSTF process is to use the evidence from the key questions to assess whether there would be net benefit if the service were implemented. In 2001, the USPSTF published an article that documented its systematic processes of evidence evaluation and recommendation development. At that time, the USPSTF's overall assessment of evidence was described as good, fair, or poor. The USPSTF realized that this rating seemed to apply only to how well studies were conducted and did not fully capture all of the issues that go into an overall assessment of the evidence about net benefit. To avoid confusion, the USPSTF has changed its terminology. Whereas individual study quality will continue to be characterized as good, fair, or poor, the term *certainty* will now be used to describe the USPSTF's assessment of the overall body of evidence about net benefit of a preventive service and the likelihood that the assessment is correct. Certainty will be determined by considering all 6 questions listed above; the judgment about certainty will be described as high, moderate, or low.

In making its assessment of certainty about net benefit, the evaluation of the evidence from each key question plays a primary role. It is important to note that the USPSTF makes recommendations for real-world medical practice in the United States and must determine to what extent the evidence for each key question—even evidence from screening RCTs or treatment RCTs—can be applied to the general primary care population. Frequently, studies are conducted in highly selected populations under special conditions. The USPSTF must consider differences between the general primary care population and the

populations studied in RCTs and make judgments about the likelihood of observing the same effect in actual practice.

It is also important to note that one of the key questions in the analytic framework refers to the potential harms of the preventive service. The USPSTF considers the evidence about the benefits and harms of preventive services separately and equally. Data about harms are often obtained from observational studies because harms observed in RCTs may not be representative of those found in usual practice and because some harms are not completely measured and reported in RCTs.

Putting the body of evidence for all key questions together as a chain, the USPSTF assesses the certainty of net benefit of a preventive service by asking the 6 major questions listed above. The USPSTF would rate a body of convincing evidence about the benefits of a service that, for example, derives from several RCTs of screening in which the estimate of benefits can be generalized to the general primary care population as "high" certainty (see the "Rating Scheme for the Strength of Recommendations" field). The USPSTF would rate a body of evidence that was not clearly applicable to general practice or has other defects in quality, research design, or consistency of studies as "moderate" certainty. Certainty is "low" when, for example, there are gaps in the evidence linking parts of the analytic framework, when evidence to determine the harms of treatment is unavailable, or when evidence about the benefits of treatment is insufficient. Table 4 in the methodology document listed below (see the "Availability of Companion Documents" field) summarizes the current terminology used by the USPSTF to describe the critical assessment of evidence at all 3 levels: individual studies, key questions, and overall certainty of net benefit of the preventive service.

Sawaya GF, Guirguis-Blake J, LeFevre M, Harris R, Petitti D; U.S. Preventive Services Task Force. Update on the methods of the U.S. Preventive Services Task Force: estimating certainty and magnitude of net benefit. Ann Intern Med. 2007;147:871-875. [5 references].

I Statements

For I statements, the USPSTF has a new plan to commission its Evidence-based Practice Centers to collect information in 4 domains pertinent to clinical decisions about prevention and to report this information routinely. This plan is described in the paper: Petitti DB et al. Update on the methods of the U.S. Preventive Services Task Force: insufficient evidence. Ann Intern Med. 2009;150:199-205. www.annals.org .

The first domain is potential preventable burden of suffering from the condition. When evidence is insufficient, provision of an intervention designed to prevent a serious condition (such as dementia) might be viewed more favorably than provision of a service designed to prevent a condition that does not cause as much suffering (such as rash). The USPSTF recognized that "burden of suffering" is subjective and involves judgment. In clinical settings, it should be informed by patient values and concerns.

The second domain is potential harm of the intervention. When evidence is insufficient, an intervention with a large potential for harm (such as major surgery) might be viewed less favorably than an intervention with a small potential for harm (such as advice to watch less television). The USPSTF again acknowledges the subjective nature and the difficulty of assessing potential harms: for example, how bad is a "mild" stroke?

The third domain is cost—not just monetary cost, but opportunity cost, in particular the amount of time a provider spends to provide the service, the amount of time the patient spends to partake of it, and the benefits that might derive from alternative uses of the time or money for patients, clinicians, or systems. Consideration of clinician time is especially important for preventive services with only insufficient evidence because providing them could "crowd out" provision of preventive services with proven value, services for conditions that require immediate action, or services more desired by the patient. For example, a decision to routinely inspect the skin could take up the time available to discuss smoking cessation, or to address an acute problem or a minor injury that the patient considers important.

The fourth domain is current practice. This domain was chosen because it is important to clinicians for at least 2 reasons. Clinicians justifiably fear that not doing something that is done on a widespread basis in

the community may lead to litigation. More important, addressing patient expectations is a crucial part of the clinician–patient relationship in terms of building trust and developing a collaborative therapeutic relationship. The consequences of not providing a service that is neither widely available nor widely used are less serious than not providing a service accepted by the medical profession and thus expected by patients. Furthermore, ingrained care practices are difficult to change, and efforts should preferentially be directed to changing those practices for which the evidence to support change is compelling.

Although the reviewers did not explicitly recognize it when these domains were chosen, the domains all involve consideration of the potential consequences—for patients, clinicians, and systems—of providing or not providing a service. Others writing about medical decision making in the face of uncertainty have suggested that the consequences of action or inaction should play a prominent role in decisions.

Rating Scheme for the Strength of the Recommendations

What the U.S. Preventive Services Task Force (USPSTF) Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer or provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer or provide this service.
C	The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.	Offer or provide this service for selected patients depending on individual circumstances.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality or conflicting, and the balance of benefits and harms cannot be determined.	Read the "Clinical Considerations" section of the USPSTF Recommendation Statement (see the "Major Recommendations" field). If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

USPSTF Levels of Certainty Regarding Net Benefit

Definition: The USPSTF defines certainty as "likelihood that the USPSTF assessment of the net benefit of a preventive service is correct." The net benefit is defined as benefit minus harm of the preventive service as implemented in a general, primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

Level of Certainty	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by factors such as:

Level of Certainty	Description
	The number, size, or quality of individual studies Inconsistency of findings across individual studies Limited generalizability of findings to routine primary care practice Lack of coherence in the chain of evidence As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: The limited number or size of studies Important flaws in study design or methods Inconsistency of findings across individual studies Gaps in the chain of evidence Findings not generalizable to routine primary care practice A lack of information on important health outcomes More information may allow an estimation of effects on health outcomes.

Cost Analysis

The U.S. Preventive Services Task Force (USPSTF) does not consider the costs of providing a service in this assessment.

Method of Guideline Validation

Comparison with Guidelines from Other Groups

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Peer Review

Before the U.S. Preventive Services Task Force (USPSTF) makes its final determinations about recommendations on a given preventive service, the Evidence-based Practice Center and the Agency for Healthcare Research and Quality send a draft systematic evidence review to 4 to 6 external experts and to federal agencies and professional and disease-based health organizations with interests in the topic. The experts were asked to examine the review critically for accuracy and completeness and to respond to a series of specific questions about the document. The draft evidence review is also posted on the USPSTF Web site for public comment. After assembling these external review comments and documenting the proposed response to key comments, the topic team presents this information to the USPSTF in memo form. In this way, the USPSTF can consider these external comments before it votes on its recommendations about the service. Draft recommendation statements are then circulated for comment among reviewers representing professional societies, voluntary organizations, and Federal agencies, as well as posted on the USPSTF Web site for public comment. These comments are discussed before the final recommendations are confirmed.

Response to Public Comment

A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from May 30 to June 26, 2017. Many comments expressed concern about the change in letter grade (from a D grade to an I statement). In response, the USPSTF added language in the "Update of Previous USPSTF Recommendation" section to explain the change in grade. Some comments sought clarification of who the recommendation applies to. The USPSTF clarified this in the "Patient Population Under Consideration" section. Other comments expressed concern that the evidence needed to change the

recommendation grade is unattainable. The USPSTF added language to address this in the "Research Needs and Gaps" section.

Recommendation of Others

Recommendations for screening for idiopathic scoliosis from the following groups were discussed: the American Academy of Orthopaedic Surgeons, the Scoliosis Research Society, the Pediatric Orthopaedic Society of North America, the American Academy of Pediatrics, the UK National Screening Society, and the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence supporting the recommendations is not specifically stated.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Benefits of Early Detection and Intervention or Treatment

The U.S. Preventive Services Task Force (USPSTF) found no direct evidence regarding the effect of screening for adolescent idiopathic scoliosis on patient-centered health outcomes. The USPSTF found inadequate evidence on the treatment of idiopathic scoliosis (Cobb angle <50° at diagnosis) in adolescents with exercise (2 small studies) or surgery (no studies) or its effects on health outcomes or the degree of spinal curvature in childhood or adulthood. The USPSTF found adequate evidence (5 studies) that treatment with bracing may decrease curvature progression in adolescents with mild or moderate curvature severity (an intermediate outcome). However, it found inadequate evidence on the association between reduction in spinal curvature in adolescence and long-term health outcomes in adulthood.

Potential Harms

Harms of Early Detection and Intervention or Treatment

The U.S. Preventive Services Task Force (USPSTF) found no studies on the direct harms of screening, such as psychological harms or harms associated with confirmatory radiography. The USPSTF found inadequate evidence to determine the harms of treatment.

Qualifying Statements

Qualifying Statements

- The U.S. Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific preventive care services for patients without obvious related signs or symptoms.
- It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this

assessment.

- The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision making to the specific patient or situation. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.
- Recommendations made by the USPSTF are independent of the U.S. government. They should not be construed as an official position of Agency for Healthcare Research and Quality (AHRQ) or the U.S. Department of Health and Human Services.

Implementation of the Guideline

Description of Implementation Strategy

The experiences of the first and second U.S. Preventive Services Task Force (USPSTF), as well as that of other evidence-based guideline efforts, have highlighted the importance of identifying effective ways to implement clinical recommendations. Practice guidelines are relatively weak tools for changing clinical practice when used in isolation. To effect change, guidelines must be coupled with strategies to improve their acceptance and feasibility. Such strategies include enlisting the support of local opinion leaders, using reminder systems for clinicians and patients, adopting standing orders, and audit and feedback of information to clinicians about their compliance with recommended practice.

In the case of preventive services guidelines, implementation needs to go beyond traditional dissemination and promotion efforts to recognize the added patient and clinician barriers that affect preventive care. These include clinicians' ambivalence about whether preventive medicine is part of their job, the psychological and practical challenges that patients face in changing behaviors, lack of access to health care or of insurance coverage for preventive services for some patients, competing pressures within the context of shorter office visits, and the lack of organized systems in most practices to ensure the delivery of recommended preventive care.

Dissemination strategies have changed dramatically in this age of electronic information. While recognizing the continuing value of journals and other print formats for dissemination, the USPSTF will make all its products available through its Web site . The combination of electronic access and extensive material in the public domain should make it easier for a broad audience of users to access USPSTF materials and adapt them for their local needs. Online access to USPSTF products also opens up new possibilities for the appearance of the annual, pocket-size Guide to Clinical Preventive Services.

To be successful, approaches for implementing prevention have to be tailored to the local level and deal with the specific barriers at a given site, typically requiring the redesign of systems of care. Such a systems approach to prevention has had notable success in established staff-model health maintenance organizations, by addressing organization of care, emphasizing a philosophy of prevention, and altering the training and incentives for clinicians. Staff-model plans also benefit from integrated information systems that can track the use of needed services and generate automatic reminders aimed at patients and clinicians, some of the most consistently successful interventions. Information systems remain a major challenge for individual clinicians' offices, however, as well as for looser affiliations of practices in network-model managed care and independent practice associations, where data on patient visits, referrals, and test results are not always centralized.

Implementation Tools

Mobile Device Resources

Patient Resources

Pocket Guide/Reference Cards

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Final recommendation statement: adolescent idiopathic scoliosis: screening. [internet]. Rockville (MD): U.S. Preventive Services Task Force (USPSTF); 2018 Jan [8 p]. [28 references]

Adaptation

Not applicable: The guideline is not adapted from another source.

Date Released

2018 Jan

Guideline Developer(s)

U.S. Preventive Services Task Force - Independent Expert Panel

Guideline Developer Comment

The U.S. Preventive Services Task Force (USPSTF) is a federally-appointed panel of independent experts. Conclusions of the U.S. Preventive Services Task Force do not necessarily reflect policy of the U.S. Department of Health and Human Services (DHHS) or its agencies.

Source(s) of Funding

The U.S. Preventive Services Task Force (USPSTF) is an independent, voluntary body. The U.S. Congress mandates that the Agency for Healthcare Research and Quality (AHRQ) support the operations of the USPSTF.

Guideline Committee

U.S. Preventive Services Task Force (USPSTF)

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*Member of the USPSTF at the time this recommendation was finalized. For a list of current Task Force members, go to https://www.uspreventiveservicestaskforce.org/Page/Name/our-members.

Financial Disclosures/Conflicts of Interest

The U.S. Preventive Services Task Force (USPSTF) has an explicit policy concerning conflict of interest. All members and disclose at each meeting if they have any significant financial conflict for each topic being discussed. Task Force members and EPC staff with conflicts can participate in discussions about evidence, but members abstain from voting on recommendations about the topic in question.

All authors have completed and submitted the International Committee of Medical Journal Editors (ICMJE) Form for Disclosure of Potential Conflicts of Interest. Authors followed the policy regarding conflicts of interest described at https://www.uspreventiveservicestaskforce.org/Page/Name/conflict-of-interest-disclosures. Dr Grossman reported that his institution (Kaiser Permanente Washington Health Research Institute) received the contract to perform the systematic evidence review for this topic but that he had no involvement in the arrangement of this contract and did not participate in any aspect of the review. All members of the USPSTF receive travel reimbursement and an honorarium for participating in USPSTF meetings.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous: U.S. Preventive Services Task Force (USPSTF). Screening for idiopathic scoliosis in adolescents: recommendation statement. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2004 Jun. 4 p. [4 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the U.S. Preventive Services Task Force (USPSTF) Web site .

Availability of Companion Documents

The following are available:

Evidence Reviews:

Dunn J, Henrikson NB, Morrison CC, Blasi PR, Nguyen M, Lin JS. Screening for adolescent idiopathic scoliosis: evidence report and systematic review for the U.S. Preventive Services Task Force. JAMA. 2018;310(2):173-87.

Dunn J, Henrikson NB, Morrison CC, Nguyen M, Blasi PR, Lin JS. Screening for adolescent idiopathic scoliosis: a systematic evidence review for the U.S. Preventive Services Task Force. Evidence Synthesis No. 156. AHRQ Publication No. 17-05230-EF-1. Rockville (MD): Agency for Healthcare Research and Quality; 2018 Jan. 175 p.

Available from the U.S. Preventive Services Task Force (USPSTF) Web site .

The following are also available:

Adolescent idiopathic scoliosis: screening. Clinical summary. Rockville (MD):U.S. Preventive Services Task Force; 2018 Jan. 1 p. Available from the USPSTF Web site .

The Electronic Preventive Services Selector (ePSS) is an application designed to provide primary care clinicians and health care teams timely decision support regarding appropriate screening, counseling and preventive services for their patients. It is based on the current, evidence-based recommendations of the USPSTF and can be searched by specific patient characteristics such as age, sex, and selected behavioral risk factors.

Patient Resources

Myhealthfinder is a tool that provides personalized recommendations for clinical preventive services specific to the user's age, gender, and pregnancy status. It features evidence-based recommendations from the USPSTF and is available at www.healthfinder.gov .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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